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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/630,658	07/31/2003	Thomas A. Taylor	CS-21320	9490

7590 12/05/2005

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EXAMINER	
BAREFORD, KATHERINE A	
ART UNIT	**PAPER NUMBER**
1762	

DATE MAILED: 12/05/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/630,658	TAYLOR, THOMAS A.	
	Examiner	Art Unit	
	Katherine A. Bareford	1762	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on 11/16/05.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-22 is/are pending in the application.

4a) Of the above claim(s) 14-20 is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-13,21 and 22 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date 11/05.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on November 16, 2005 has been entered.

The amendment filed with the RCE submission of November 16, 2005 has been received and entered.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claim 21 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 21, line 3, "non-reactive materials" is indefinite and confusing as worded, because it is unclear what the materials must be non-reactive to. Must they be non-reactive to all other materials, or just to oxidation or oxidation and nitridation? The

Examiner also notes that as to the phrase "ceramics, oxides, nitrides, carbides" that "ceramics" is inclusive of "oxides", "carbides" and "nitrides".

In the amendment of Nov. 16, 2005, applicant did not address this rejection, which was provided in the Office Action of May 24, 2005. Therefore, the rejection is maintained.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 1-13 and 21-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zurecki et al (US 5738281) in view of Nowotarski et al (US 5486383) and the admitted state of the prior art.

Zurecki teaches a method of placing a gas shroud around a turbulent gas jet. Column 1, lines 5-15. This method can be used in spraying applications, such as thermal spray coating. Column 4, lines 15-25. A jet exits from an orifice of the thermal spray device and is surrounded with a coaxial gas shield having a shield gas flow substantially surrounding the effluent of the thermal spray device. Column 3, lines 1-25. By using an inert surrounding gas, when thermal spraying, the amount of oxygen

aspirated into the jet is reduced, thus minimizing the oxidation of the sprayed coating material and providing a desired microstructure of a coating with minimized oxidation of the coating material as supplied. Column 4, lines 15-25. As shown by Example 3, oxygen concentration in the spray jets of shrouded spray devices of Zurecki can be well over 50% less that for unshrouded jets at the same standoff distance (3 inches). Column 9, lines 45-55 and column 11, lines 10-60, note, for example, in run no. 2, for example, with no shroud gas flow, the first or 0 flow rate, oxygen conc. is 14.0, going down to 2.1 as the flow rate of the shroud gas is increased (Table 2).

Claim 3: As shown by Example 3, oxygen concentration in the spray jets of shrouded spray devices of Zurecki can be well over 50% less that for unshrouded jets at the same standoff distance (3 inches). Column 9, lines 45-55 and column 11, lines 10-60, note, for example, in run no. 2, for example, with no shroud gas flow, the first or 0 flow rate, oxygen conc. is 14.0, going down to 2.1 as the flow rate of the shroud gas is increased (Table 2).

Claim 4, 5: the gas flow can be essentially turbulent. Column 3, lines 5-30 (the spray effluent from the spray device is turbulent, and the shroud gas is entrained in that flow).

Claim 9: the shield (shroud) gas can be nitrogen. See column 11, lines 10-60.

Zurecki teaches all the features of these claims except (1) that the resulting effect on microstructure will allow an extended standoff distance for the same microstructure, (2) that the material to be sprayed is a ceramic oxide (claim 2, 6, 11, 21) which would be

not sensitive to oxidation or nitridation (claim 1), (3) that the shield gas is argon (claim 10) (4) that the ceramic oxide is zirconia (claims 7, 12), (5) that the multiple layers of coating material are provided (claims 8, 13), and (6) that the substrate has a complex shape such as turbine blades or vanes (claims 1, 22).

However, Nowotarski teaches that when thermal spraying a turbulent fluid stream is ejected from a spray nozzle. Column 3, lines 20-60. The stream can carry coating material which can be metals, alloys, oxides, ceramics, and other materials. Column 3, lines 20-65. Nowotarski teaches the desire to surround the stream with a shielding gas flow of an inert gas such as nitrogen, argon, etc. See column 3, line 60 through column 4, line 40. The use of this shielding gas prevents oxygen from entering the spray stream so that oxidation or contamination or degradation of materials is minimized. Column 4, lines 20-35. The amount of shielding fluid used is such that the oxygen level at the point of impact can be less than 1%. Column 4, lines 25-35. Nowotarski teaches that by reducing the oxygen level, the standoff distance can be increased. Column 7, lines 35-55.

The admitted state of the prior art, at pages 4-5, teaches that it is well known to apply ceramic coatings by thermal spraying. These ceramic coatings can include thermal barrier coatings. The thermal barrier coatings are often multilayer coatings with a metallic bond coat followed by a ceramic top coat. The ceramic top coat is usually based on zirconium oxide (zirconia). The metallic bond coat can also be applied

by thermal spraying. The admitted state of the art further teaches that it is well known to apply these thermal spray coatings to complex shapes such as turbine vanes.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Zurecki to increase the standoff distance for the same microstructure as suggested by Nowotarski in order to provide a desirable coating, because Zurecki teaches that the use of the coaxial shielding gas provides a decreased oxygen level in the spray stream for a given distance, thus reducing oxidation of the applied coating (that is, providing a desired microstructure of limited further oxidation) and Nowotarski teaches that the use of shielding gas that provides a decreased oxygen level in the spray stream for a given distance can allow an increased standoff distance, and that the shielding gas can be used to reduce oxidation, contamination or degradation of the material (again providing a desired microstructure). This provides a longer standoff distance to get the same microstructure as without shielding, because the resulting microstructure provided by the presence of a first amount of oxygen will not occur until a longer standoff distance when shielding is used since that first amount of oxygen will be present in the stream a much greater distance (more than 50 % as shown by Zurecki) from the nozzle. It would further have been obvious to modify Zurecki to perform the spraying with ceramic oxides, which would be materials not sensitive to oxidation or nitridation, as taught by Nowotarski with an expectation of desirable coating results, because Nowotarski teaches the desire to shield coatings of ceramics and oxides as well as metals, as the shield also prevents contamination. It

would further have been obvious to modify Zurecki to perform the shielding with argon as taught by Nowotarski with an expectation of desirable coating results, because Zurecki teaches the desire to shield with an inert gas, such as nitrogen, and Nowotarski teaches the desire to shield coating sprays with inert gases, which can include argon as well as nitrogen. It would further have been obvious to modify Zurecki in view of Nowotarski to apply a zirconia coating and to apply a multilayer coating such as a thermal barrier coating of metallic bond coat followed by ceramic top coat and to apply the coating to a complex shape such as a turbine vane/blade as suggested by the admitted state of the prior art with an expectation of providing a desirable coating, because Zurecki in view of Nowotarski teaches a gas shielding system for thermal spraying that can be used with metals or ceramic oxides and the admitted state of the prior art teaches that when thermal spraying a desirable coating system to apply is metal bond coats followed by zirconia top coats to a complex shaped substrate such as a turbine vane/blade.

6. Claims 1-13 and 21-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zurecki et al (US 5738281) in view of Nowotarski et al (US 5486383) and Taylor, et al "Experience with M Cr Al and thermal barrier coatings produced via inert gas shrouded plasma deposition" (hereinafter Taylor article).

Zurecki teaches a method of placing a gas shroud around a turbulent gas jet. Column 1, lines 5-15. This method can be used in spraying applications, such as

thermal spray coating. Column 4, lines 15-25. A jet exits from an orifice of the thermal spray device and is surrounded with a coaxial gas shield having a shield gas flow substantially surrounding the effluent of the thermal spray device. Column 3, lines 1-25. By using an inert surrounding gas, when thermal spraying, the amount of oxygen aspirated into the jet is reduced, thus minimizing the oxidation of the sprayed coating material and providing a desired microstructure of a coating with minimized oxidation of the coating material as supplied. Column 4, lines 15-25. As shown by Example 3, oxygen concentration in the spray jets of shrouded spray devices of Zurecki can be well over 50% less that for unshrouded jets at the same standoff distance (3 inches). Column 9, lines 45-55 and column 11, lines 10-60, note, for example, in run no. 2, for example, with no shroud gas flow, the first or 0 flow rate, oxygen conc. is 14.0, going down to 2.1 as the flow rate of the shroud gas is increased (Table 2).

Claim 3: As shown by Example 3, oxygen concentration in the spray jets of shrouded spray devices of Zurecki can be well over 50% less that for unshrouded jets at the same standoff distance (3 inches). Column 9, lines 45-55 and column 11, lines 10-60, note, for example, in run no. 2, for example, with no shroud gas flow, the first or 0 flow rate, oxygen conc. is 14.0, going down to 2.1 as the flow rate of the shroud gas is increased (Table 2).

Claim 4, 5: the gas flow can be essentially turbulent. Column 3, lines 5-30 (the spray effluent from the spray device is turbulent, and the shroud gas is entrained in that flow).

Claim 9: the shield (shroud) gas can be nitrogen. See column 11, lines 10-60.

Zurecki teaches all the features of these claims except (1) that the resulting effect on microstructure will allow an extended standoff distance for the same microstructure, (2) that the material to be sprayed is a ceramic oxide (claim 2, 6, 11, 21) which would be not sensitive to oxidation or nitridation (claim 1), (3) that the shield gas is argon (claim 10) (4) that the ceramic oxide is zirconia (claims 7, 12), (5) that the multiple layers of coating material are provided (claims 8, 13), and (6) that the substrate has a complex shape such as turbine blades or vanes (claims 1, 22).

However, Nowotarski teaches that when thermal spraying a turbulent fluid stream is ejected from a spray nozzle. Column 3, lines 20-60. The stream can carry coating material which can be metals, alloys, oxides, ceramics, and other materials. Column 3, lines 20-65. Nowotarski teaches the desire to surround the stream with a shielding gas flow of an inert gas such as nitrogen, argon, etc. See column 3, line 60 through column 4, line 40. The use of this shielding gas prevents oxygen from entering the spray stream so that oxidation or contamination or degradation of materials is minimized. Column 4, lines 20-35. The amount of shielding fluid used is such that the oxygen level at the point of impact can be less than 1%. Column 4, lines 25-35. Nowotarski teaches that by reducing the oxygen level, the standoff distance can be increased. Column 7, lines 35-55.

Taylor article teaches that it is well known to apply ceramic coatings by plasma spraying, a form of thermal spraying. Page 2526. These ceramic coatings can include

thermal barrier coatings. Page 2526. The thermal barrier coatings can be a multilayer coatings with a metallic bond coat followed by a ceramic top coat. Page 2527. The ceramic top coat is can be based on zirconium oxide (zirconia). Page 2527. The metallic bond coat can also be applied by plasma spraying. Page 2527 (the M Cr Al coat). Taylor article further teaches that it is well known to apply these thermal spray coatings to complex shapes such as turbine vanes. See page 2530, first column. Taylor article also teaches that it is beneficial to apply the M Cr Al coat by shrouded plasma spraying. Pages 2526-2527. Furthermore, Taylor article teaches that the oxide ceramic thermal barrier overcoat can also desirably be applied by the same shrouded plasma spray system, allowing the two layer system to be applied in the same setup using the same torch by simply switching from one powder dispenser to another. Page 2527, first column. The shrouding gas can be argon. Page 2526.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Zurecki to increase the standoff distance for the same microstructure as suggested by Nowotarski and Taylor article in order to provide a desirable coating, because Zurecki teaches that the use of the coaxial shielding gas provides a decreased oxygen level in the spray stream for a given distance, thus reducing oxidation of the applied coating (that is, providing a desired microstructure of limited further oxidation) and Nowotarski teaches that the use of shielding gas that provides a decreased oxygen level in the spray stream for a given distance can allow an increased standoff distance, and that the shielding gas can be used to reduce oxidation,

contamination or degradation of the material (again providing a desired microstructure) and Taylor article further teaches that it is desirable to use a shrouding (shielding) gas when thermal spraying materials such as oxide thermal barrier coatings to provide more efficient spraying. This provides a longer standoff distance to get the same microstructure as without shielding, because the resulting microstructure provided by the presence of a first amount of oxygen will not occur until a longer standoff distance when shielding is used since that first amount of oxygen will be present in the stream a much greater distance (more than 50 % as shown by Zurecki) from the nozzle. It would further have been obvious to modify Zurecki to perform the spraying with ceramic oxides, which would be materials not sensitive to oxidation or nitridation and to apply a zirconia coating and to apply a multilayer coating such as a thermal barrier coating of metallic bond coat followed by ceramic top coat and to apply the coating to a complex shape such as a turbine vane/blade as suggested by Nowotarski and Taylor article with an expectation of desirable coating results, because Nowotarski teaches the desire to shield coatings of ceramics and oxides as well as metals, as the shield also prevents contamination and Taylor article teaches that when thermal spraying a desirable coating system to apply is metal bond coats followed by zirconia top coats to a complex shaped substrate such as a turbine vane/blade using a shrouded plasma spraying system. It would further have been obvious to modify Zurecki to perform the shielding with argon as taught by Nowotarski and Taylor article with an expectation of desirable coating results, because Zurecki teaches the desire to

shield with an inert gas, such as nitrogen, and Nowotarski teaches the desire to shield coating sprays with inert gases, which can include argon as well as nitrogen and Taylor article further teaches the use of argon as a shielding gas when plasma spraying oxides.

Response to Arguments

7. Applicant's arguments filed November 16, 2005 have been fully considered but they are not persuasive.

As to the rejection using Zurecki and Nowotarski as provided in the Final Rejection of May 24, 2005, the Examiner notes that these references have further been combined with the admitted state of the prior art as in the Final Rejection of claims 7, 8, 12 and 13 of May 24, 2005, as the admitted state provides for the thermal spray of a substrate of complex shape such as turbine blade or vanes as required by amended claim 1 and new claim 22. The Examiner also notes that a further, new rejection, using Zurecki, Nowotarski and Taylor article has been provided as in paragraph 6 above.

Applicant argues as to the combination of Zurecki and Nowotarski that (1) Nowotarski is directed to prevent reactive gases from being entrained in the turbulent gas. (2) Applicant further argues that as to the increased standoff distance, column 7, lines 35-55 of Nowotarski is directed to indicated that heating a shielding gas obtains a longer standoff distance. Applicant argues that their invention is directed to provide a unique method of thermally spraying materials not sensitive to oxidation or nitridation by using a gas shield to produce a coating with a desired microstructure using an

extended standoff that is at least 20% longer than the standoff of thermal spray without a gas shield to produce the same microstructure. Applicant argues that it would not be thought to use a gas shield when spraying a material not sensitive to oxidation or nitridation as claimed by applicant, but applicant has found that there are additional benefits to be gained by using such a shield, by controlling temperature of the thermal spray effluent. Moreover, applicant argues that they have found that this temperature effect is sensitive to the flow rate of the shield gas, and that there is an optimum flow rate. Applicant argues that Zurecki uses the shield gas to protect the spray from reaction with ambient gases, and does not teach or suggest using the shrouding gas to a material not sensitive to oxidation or nitridation or the lengthening of the standoff distance, and that Nowotarski does not suggest these features either. Applicant argues that to provide obviousness, the Examiner needs to provide more than an "obvious to try" standard, and it is only through hindsight that the Examiner would provide that the combination of references provides the claimed invention. As to the use of the admitted state of the prior art, applicant further argues that it does not correct the defects of the combination of Zurecki and Nowotarski.

The Examiner has reviewed these arguments, however, the rejection is maintained. First, as to the combination of Zurecki, Nowotarski and the admitted state of the prior art: as to applicant's argument that Nowotarski is directed only to the prevention of reactive gases from entering the stream, the Examiner notes that Nowotarski refers to the presence of "reactive gases" being prevented from entering the

spray stream. However, Nowotarski specifically teaches that the coating material can be "plastics", "oxides", "ceramics" and "certain glasses" (column 3, lines 55-60). Many materials in this grouping as well known to commonly be insensitive to oxidation or nitridation. Also while Nowotarski teaches that the turbulent stream prevents the entry of "reactive gases", it still indicates that contamination or degredation of materials is possible, a problem different from "oxidation or nitridation" (column 4, lines 20-30). The claim does not prevent any reaction from occurring, merely that the spray materials are not sensitive to oxidation or nitridation. As to applicant's argument that the increased standoff distance is due to heating in Nowotarski, the Examiner notes that (a) the claim does not prevent heating to further increase standoff distance and (b) that column 7, lines 35-55 also shows that reduced oxidation percentage allows a longer standoff, and Zurecki at Table 3, column 2, shows that the use of a shroud allows for reduced oxygen percentage as opposed to a shroud free spray, thus indicating that a shroud alone provides for increased standoff distance. As to the argument that one would not use a gas shield when spraying a material not sensitive to oxidation or ntridation, as discussed above, Nowotarski specifically teaches the use of "plastics", "oxides", "ceramics" and "certain glasses" (column 3, lines 55-60). Many materials in this grouping as well known to commonly be insensitive to oxidation or nitridation. Also while Nowotarski teaches that the turbulent stream prevents the entry of "reactive gases", it still indicates that contamination or degredation of materials is possible, a problem different from "oxidation or nitridation" (column 4, lines 20-30). The claim

does not prevent any reaction from occurring, merely that the spray materials are not sensitive to oxidation or nitridation. As to the temperature effect, this is not claimed, and furthermore, the fact that applicant has recognized another advantage which would flow naturally from following the suggestion of the prior art cannot be the basis for patentability when the differences would otherwise be obvious. See *Ex parte Obiaya*, 227 USPQ 58, 60 (Bd. Pat. App. & Inter. 1985). As to the claimed optimum flow rate, it is noted that the features upon which applicant relies are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993). As the Examiner has provided all the features of the claimed invention as being suggested to perform, it is not an "obvious to try" rationale. In response to applicant's argument that the examiner's conclusion of obviousness is based upon improper hindsight reasoning, it must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the applicant's disclosure, such a reconstruction is proper. See *In re McLaughlin*, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971). Here, the Examiner has provided all the features as claimed from the provided references.

Secondly as to the newly provided combination of Zurecki, Nowotarski, and Taylor article, the above paragraph by the Examiner as to Zurecki, Nowotarski and the

admitted state of the art applies for the same reasons as to the use of Zurecki and Nowotarski. Furthermore, Taylor article also provides the use of a shield gas when spraying a oxidation/nitridation resistant materials such as zirconia for thermal barrier coatings. Taylor article speaks of the further benefits of efficiency by being able to use the same spray system for the thermal barrier coating and the underlying M Cr Al coating.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Katherine A. Bareford whose telephone number is (571) 272-1413. The examiner can normally be reached on M-F(6:00-3:30) with the First Friday Off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Timothy Meeks can be reached on (571) 272-1423. The fax phone numbers for the organization where this application or proceeding is assigned are (571) 273-8300 for regular communications and for After Final communications.

Other inquiries can be directed to the Tech Center 1700 telephone number at (571) 272-1700.

Furthermore, information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

KATHERINE BAREFORD
PRIMARY EXAMINER